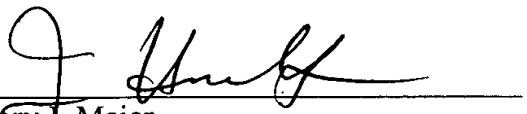
REMARKS/ARGUMENTS

Favorable reconsideration of this application, based upon the following discussion is respectfully requested. A Declaration Under 37 CFR 1.132 by Katsuyuki Suzuki, one of the co-inventors of the present application will be filed with the United States Patent Office once such is signed by the inventor. Such declaration, a copy of which is attached hereto, serves to emphasis the importance of the claimed limitation in claim 1 as now pending that the core diameter of the hole forming tool is in the range of 0.38D to 0.42D wherein D comprises a cutting edge diameter of the hole forming tool. In view of the declaration and in view of discussion on page 7, lines 14-23 as to the criticality of this limitation and in view of the previously submitted arguments with respect to the fact of the prior art of record fails to teach or disclose this limitation, it is submitted that claim 1 as well as all claims dependent therefore and all additional independent claims now pending containing this limitation patentably define over the prior art of record. It is further noted in this regard that insofar as each of independent claims 4, 6, 7, 11 and 16-22 contains this limitations, each of such independent claims is also believed to be allowable.

In view of the foregoing, an early and favorable office action is believed to be in order and the same is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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DOCKET NO: 205279US3X

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
KATSUYUKI SUZUKI, ET AL.	: EXAMINER: PIERCE, WILLIAM M.
SERIAL NO: 09/821,069	:
FILED: MARCH 30, 2001	: GROUP ART UNIT: 3711
RCE FILED: SEPTEMBER 8, 2003	:
FOR: HOLE FORMING TOOL	

DECLARATION UNDER 37 CFR 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

I Katsuyuki SUZUKI hereby declare that I am one of the co-inventors of U.S. application serial no. 09/821,069. I further declare that I am Section Manager of the Development Section G of Mitsubishi Metals Corporation of 1-5-1, Ohtemachi, Chiyoda-ku, Tokyo Japan 100-8117, one of the co-assignees of the present application and that my experience in materials engineering is as follows:

April, 1990	Entered Mitsubishi Metals K. K. (now Mitsubishi Materials)
April 1991	Assigned to Gifu Factory, Production Division
November 1991	Transferred to Gifu Factory, Drill Division (engaged in product development)
July 1995	Assigned to Chuo Seiko K. K. (now Roytec), Hiroshima Factory (management and technology of gun drill production section)
August 1998	Returned to Gifu Factory (engaged in product development)
April 2001	Transferred to Gifu Factory, Development Section (management of Cutting Tools Development Section)
July 2002	Management of Application Engineer Section (concurrently)

I further declare that claim 1 as presently amended in the above-noted application claims a hole forming tool as follows:

1. A hole forming tool which rotates around a rotational axis, comprising:

one or more chip discharging grooves which are helically formed around a rotational axis in an exterior surface of said hole forming tool, said chip discharging grooves having an inner surface; and

one or more cutting edges which are formed along ridge lines between inner surfaces of said chip discharging grooves, which are facing the rotating direction, and flank faces formed at an end of said hole forming tool,

wherein a radial rake angle of said cutting edges is set to a negative value in a range of -5° to -10°, a point angle thereof is in a range of 125° to 135°, a groove width ratio thereof is in a range of 0.9 to 1.1 and wherein a core diameter thereof is in a range of 0.38D to 0.42D, wherein D comprises a cutting edge diameter of said hole forming tool.

As noted above, an important limitation of the claimed invention is that the core diameter of the tool is in a range of 0.38D to 0.42D, as discussed on page 7, lines 14-23 of the specification. I further declare that I have conducted an experiment to ascertain the influence of the thickness (diameter) of the core on cutting efficiency in machining a high-hardness member, the results of which are attached hereto to help confirm that stable cutting efficiency can be obtained by making the thickness (diameter) of the core be in the range of 0.38D to 0.42D, as claimed, wherein D comprise the cutting edge diameter of the hole forming tool.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements in the likes made

are punishable by fine or imprisonment are both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,

_____

Katsuyuki SUZUKI

Date: _____

Enclosure: Attachment A (pages 1-7)
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Tool specification list

		Kind of materials (ISO classification)	Core thickness	Groove width ratio	Radial rake angle	Point angle	Helix angle
Present invention	A	Z10	0.40×D	1.0:1	-7°	130°	10°
Comparative product	B	Z10	0.50×D	1.0:1	-7°	130°	10°
〃	C	Z10	0.45×D	1.0:1	-7°	130°	10°
〃	D	Z10	0.35×D	1.0:1	-7°	130°	10°
〃	E	Z10	0.30×D	1.0:1	-7°	130°	10°

According to the present experiment, in order to ascertain the influence that the thickness of a core has on cutting efficiency in machining a high-hardness member, only the thickness of the core is changed and the other factors (kinds of materials, width of a groove, radial rake angle, point angle, and helix angle) are fixed.

The thickness of the core according to the present invention is 0.40×D that is an intermediate value of values defined in the claims. The thickness of the core of the comparative product has four types as shown in the tool specification list of the table and the cutting efficiency of each thickness is compared with each other.

The experiment result is illustrated after the next page.

(Conclusion)

According to the present experiment, when a high-hardness member is perforated, it could be understood that stable cutting efficiency (hole accuracy and the life of a tool) can be obtained by making the thickness of the core (0.38~0.42)×D (D: tool diameter).

The end

Cutting resistance (Thrust)

Comment

The comparative product B with large core thickness is broken on a low speed/low-feed side. It is conjectured that this breakage is caused by chip clogging.

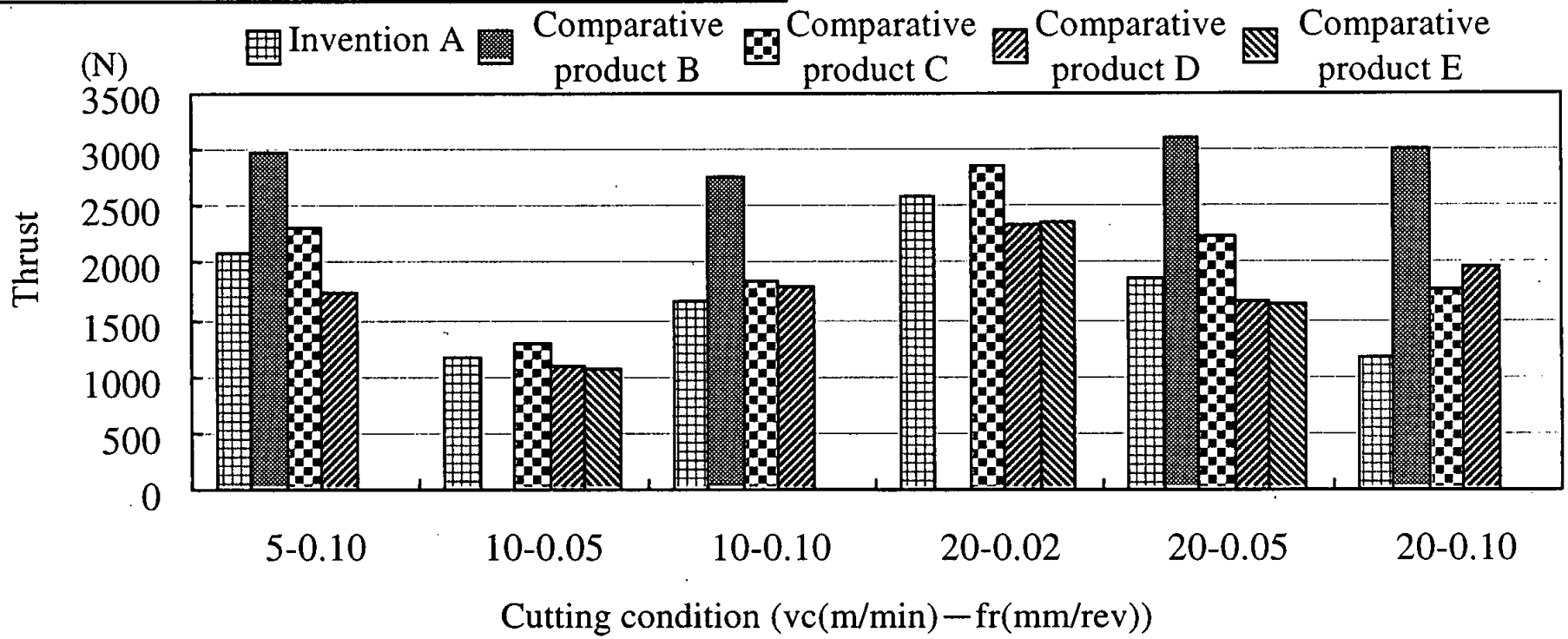
Also, in the comparative product E with small core thickness, tool stiffness is low. Therefore, the comparative product E is broken on a high-feed side (fr=0.10).

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)



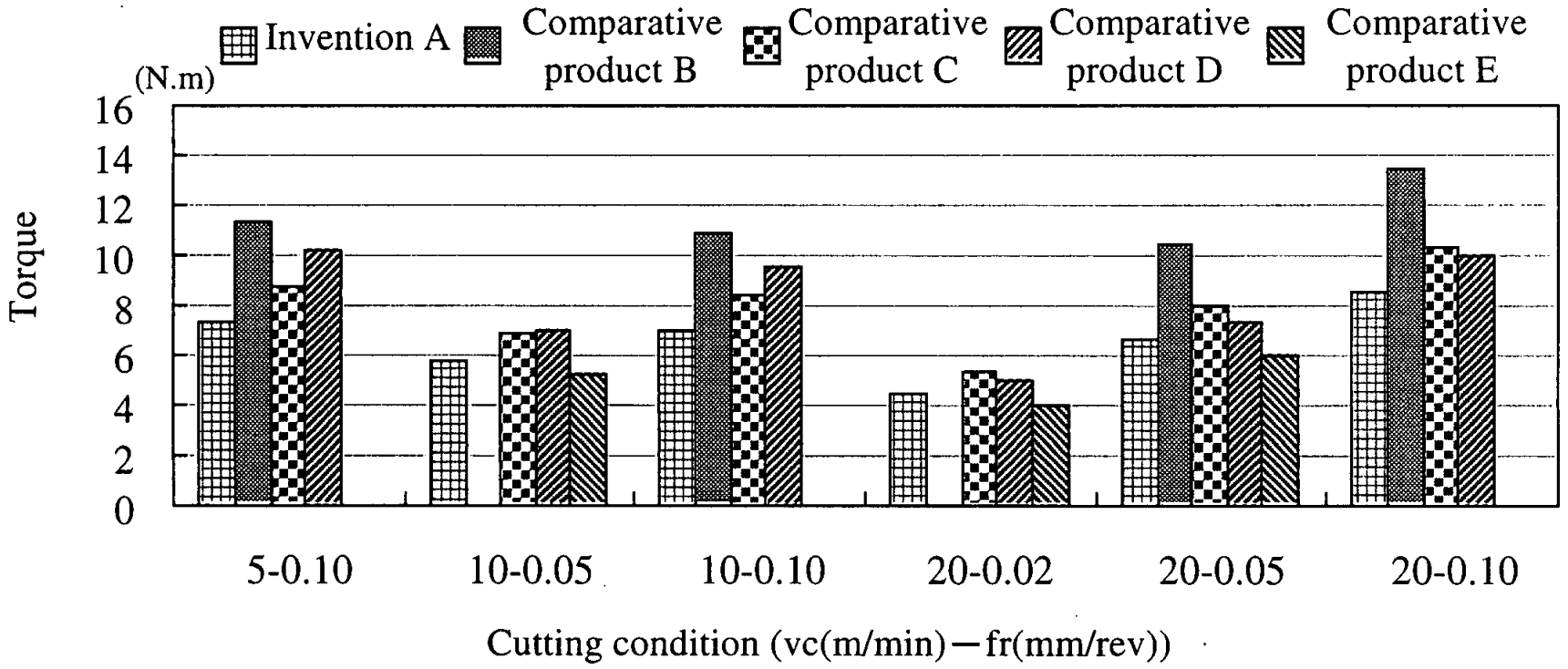
Cutting resistance (Torque)

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)



Hole accuracy (Over size)

Comment

When the thickness of the core is small, the tool stiffness is low. Therefore, the tool chatters when a workpiece is bitten, and the over size deteriorates (comparative product E).

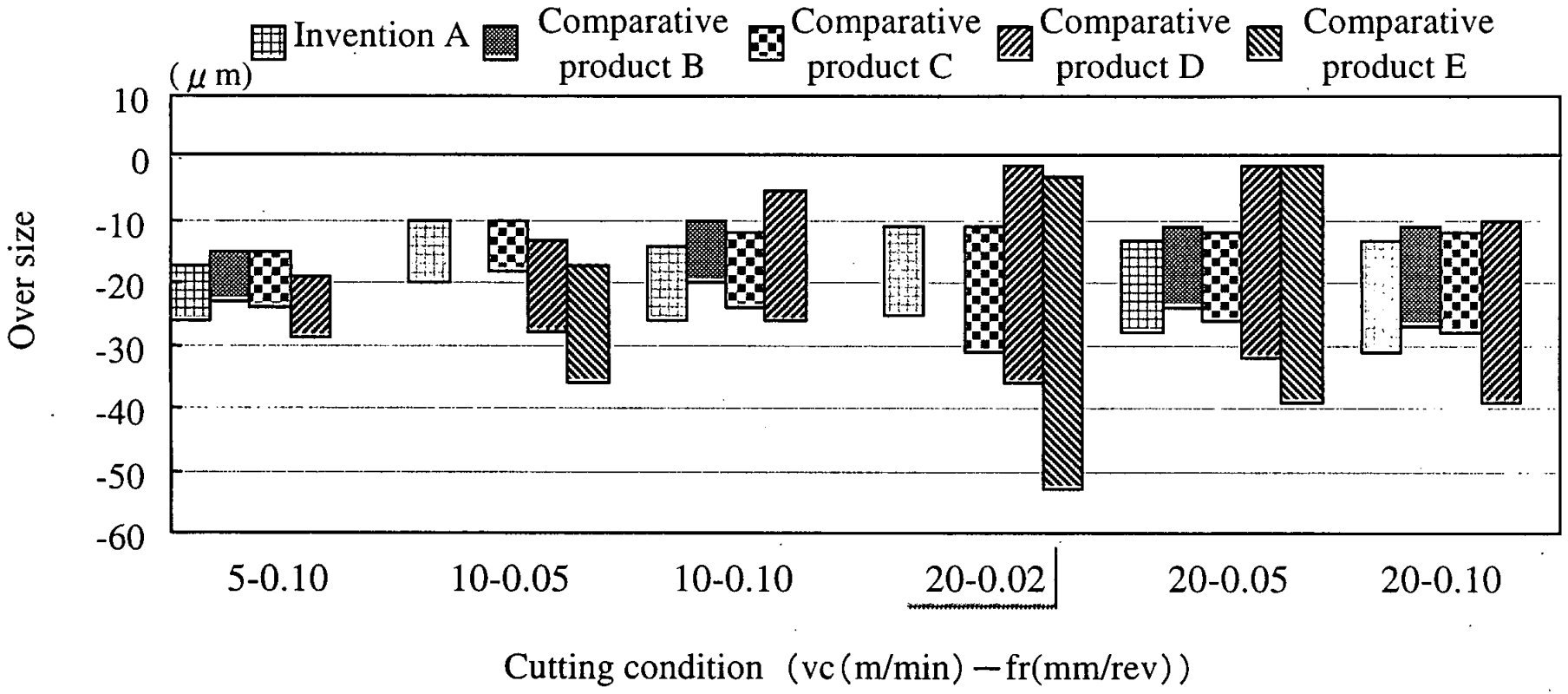
Also, undulation is shown on the machined surface of the workpiece. Accordingly, it is conjecture that the minus value of the over size is large.

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)



Hole accuracy (Surface roughness)

Comment

When the thickness of a core is large, a groove space is narrow. Therefore, chips make the machined surface rough, and the surface roughness deteriorates (comparative product B).

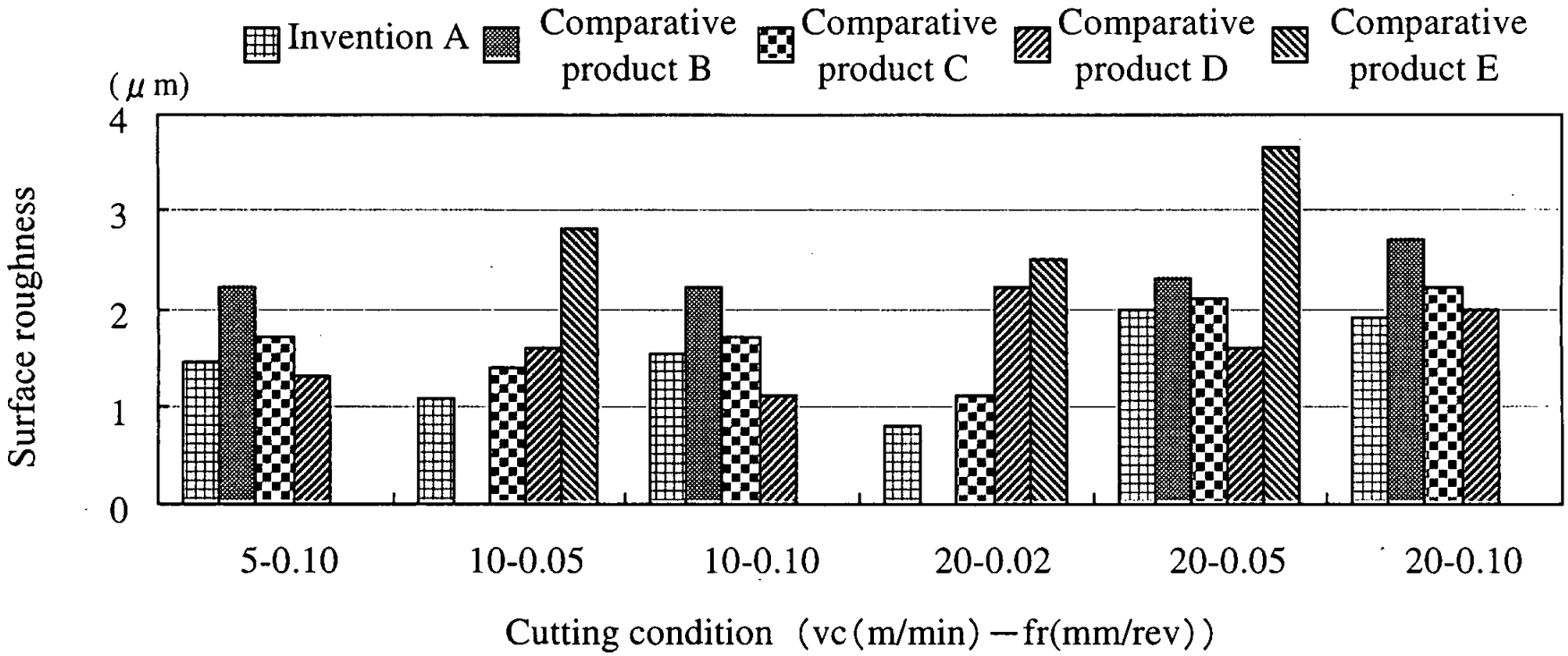
Also, when the thickness of a core is small, the tool stiffness is low. Therefore, the tool chatters when a workpiece is bitten. A varnishing effect is reduced. The surface roughness deteriorates (comparative product E).

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)



Hole accuracy (Roundness)

Comment

On the low-feed side, the roundness of the comparative products D and E deteriorates compared to that of the present invention.

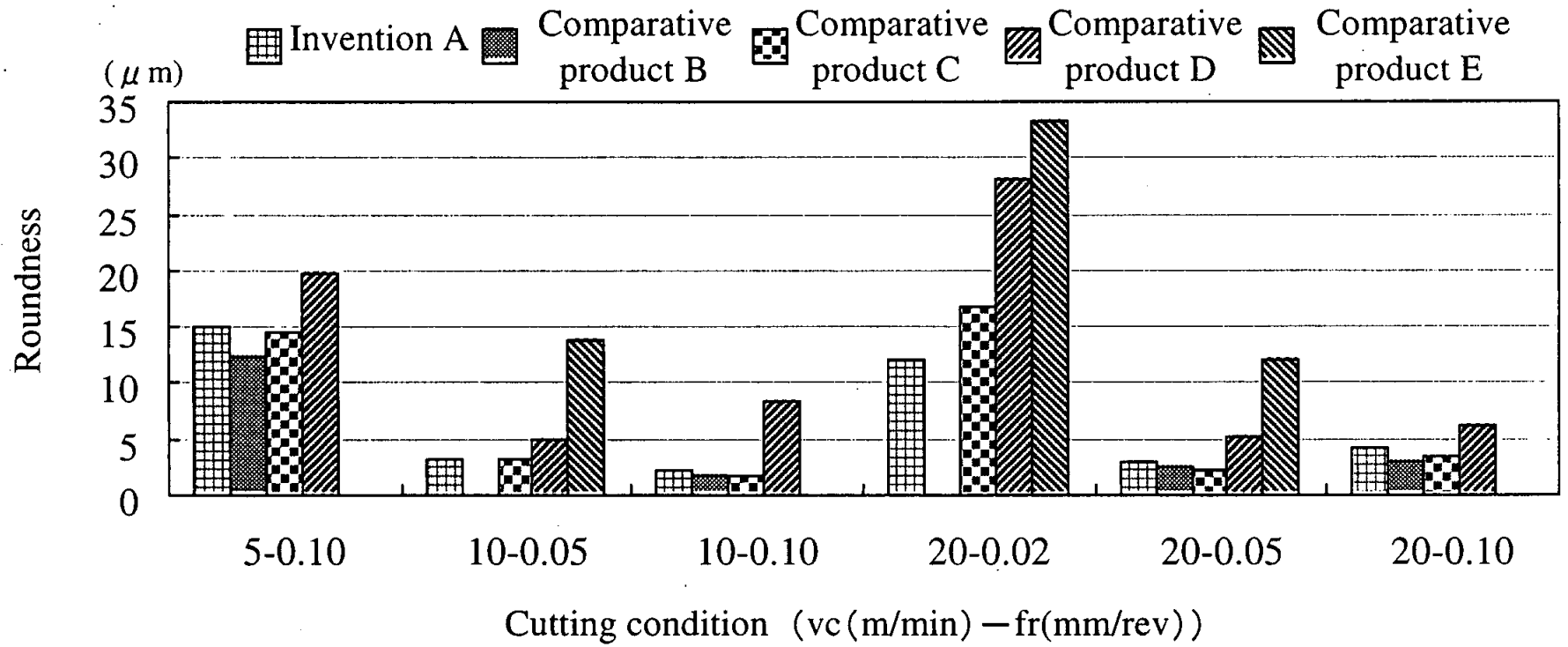
In particular, such a phenomenon is remarkable under the condition where vc=20 and fr=0. 02.

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)



Cutting efficiency (Life of tool)

Comment

For the cutting condition, a condition is selected that can be machined by all of the tools.

As a result, all of the tools are normally abraded to have a common life. The comparative product is quickly abraded and has a short life compared to the present invention because cutting resistance is high (comparative product B) or the tool stiffness is low (comparative product E).

Tool diameter: ϕ10 mm

Workpiece: SKD11 (60 HRC)

Cutting condition: vc=20 m/min, fr=0. 05 mm/rev

Machining depth: 30 mm

Cutting fluid: water-soluble emulsion (diluted 10%)